PROBABILITY

Probability: It is the numerical measurement of the degree of certainty. There are two types of approaches to study probability

Experimental or Empirical Probability: The result of probability based on the actual experiment is called experimental probability. In this case, the results could be different if we do the same experiment again.

Probability — A Theoretical Approach: In the theoretical approach, we predict the results without performing the experiment actually. The other name of theoretical probability is classical probability.

Probability of Occurrence of an Event

$$P(E) = \frac{Number\ of\ Outcomes\ of\ Favourable\ to\ E}{Total\ number\ of\ possible\ outcomes}$$

Theoretical probability associated with an event **E** is defined as "If there are 'n' elementary events associated with a random experiment and m of these are favourable to the event E then the probability of occurrence of an event is defined by P(E) as the ratio mn ".

If P(E) = 1, then it is called a 'Certain Event'.

If P(E) = 0, then it is called an 'Impossible Event'.

The probability of an event E is a number P(E) such that: $0 \le P(E) \le 1$

An event having only one outcome is called an **elementary event**. The sum of the probabilities of all the elementary events of an experiment is 1.

For any event E, $P(E) + P(\bar{E}) = 1$, where $\bar{E}$ stands for 'not E'. E and $\bar{E}$ are called **complementary events.**

Favourable outcomes are those outcomes in the sample space that are favourable to the occurrence of an event.

Sample Space: A collection of all possible outcomes of an experiment is known as sample space. It is denoted by 'S' and represented in curly brackets.

Examples of Sample Spaces:

A coin is tossed = Event

E1 = Getting a head (H) on upper face

E2 = Getting a tail (T) on upper face

S = {H, T}

Total number of outcomes = 2

Two coins are tossed = Event = E

E1 = Getting a head on coin 1 and a tail on coin 2 = (H, T)

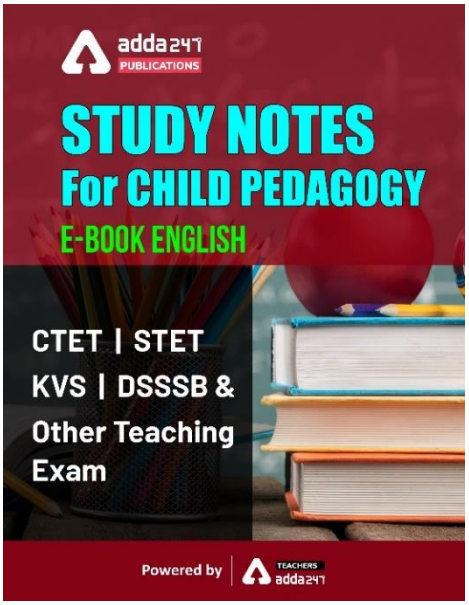
E2 = Getting a head on both coin 1 and coin 2 = (H, H)

E3 = Getting a tail on coin 1 and a head on coin 2 = (T, H)
E4 = Getting a tail on both, coin 1 and coin 2 = (T, T)
S = {(H, T), (H, H), (T, H), (T, T)}.
Total number of outcomes = 4

Important Note:
Coin: A coin has two faces termed as Head and Tail.
Dice: A dice is a small cube which has between one to six spots or numbers on its sides, which is used in games.
Cards: A pack of playing cards consists of four suits called Hearts, Spades, Diamonds and Clubs. Each suite consists of 13 cards.

Example 1. A coin is tossed 10 times and the outcomes are observed as:
H, T, H, T, T, H, H, T, H, H (H is Head; T is Tail)
What is the probability of getting Head?
(a) $\frac{3}{5}$
(b) $\frac{4}{5}$
(c) $\frac{2}{5}$
(d) $\frac{1}{5}$
Ans.(a)
Sol. Probability of Getting Head
$= \frac{6}{10}$
$= \frac{3}{5}$

Example 2. A bag contains 3 white, 2 blue and 5 red balls. One ball is drawn at random from the bag. What is the probability that the ball drawn is <u>not</u> red?
(a) $\frac{1}{2}$
(b) $\frac{4}{5}$
(c) $\frac{3}{10}$
(d) $\frac{1}{5}$
Ans.(a)
Sol. P (a) = $\frac{Favourable\ outcome}{Total\ outcome} = \frac{5}{10} = \frac{1}{2}$



Example 3. Which of the following statement is incorrect?
(a) Probability of an event lies between 0 and 1.
(b) Probability of an impossible event is 1 and that of a sure event is 0.
(c) Probability is the measure of the chance of an event happening.
(d) None of these
Ans.(b)
Sol. correct statement ⟹ Probability of an impossible event is 0 and that of a sure event is 1.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